

I claim:

1. A conversion coating bath including a coating composition comprising:
 - a. chromium (III) ions,
 - b. cobalt (II) ions, and
 - c. nitrate ions,

said composition including a ratio of nitrate ions to the combination of chromium (III) and cobalt (II) ions of less than 1.5:1 being substantially free of chromium (VI) ions and substantially free of an oxidizing agent.

2. The bath of claim 1 further comprising water.
3. The bath of claim 1 further comprising sulfate ions.
4. The bath of claim 1 further comprising a film polisher.
5. The bath of claim 4 wherein said film polisher comprises fluoride salts.
6. The bath of claim 1 having a pH between about 1.5 and 3.0.
7. The conversion coating bath of claim 1 further comprising about:
 - a. 0.020 to 0.075 mole/L chromium (III) ions,
 - b. 0.010 to 0.035 mole/L cobalt (II) ions, and
 - c. 0.010 to 0.045 mole/L nitrate ions.
8. A conversion coating bath composition comprising:
 - a. about 0.020 to 0.075 mole/L chromium (III) ions,
 - b. about 0.010 to 0.035 mole/L cobalt (II) ions,
 - c. a film polishing agent, and
 - d. about 0.010 to 0.045 mole/L nitrate ions,said composition being substantially free of chromium (VI) ions and substantially free of an oxidizing agent.
9. The composition of claim 8 wherein said film polishing agent comprises fluoride ions.

10. The composition of claim 8 having a pH between 1.5-3.0.
11. A concentrate for forming a conversion coating bath comprising:
 - a. chromium (III),
 - b. cobalt (II), and
 - c. nitric acid,and being substantially free of chromium (VI) ions and substantially free of an oxidizing agent and including less than 1.5 to 1 nitric acid to chromium (III) plus cobalt (II).
12. A method for applying a conversion coating onto an article comprising the steps of:
 - a. plating the article with zinc, and
 - b. exposing the article to a conversion coating composition comprising water, chromium(III) ions, cobalt(II) ions, fluoride ions, and nitrate ions, said conversion coating being substantially free of chromium (VI) ions and substantially free of an oxidizing agent, and including a ratio of nitrate ions to chromium (III) and cobalt (II) ions of less than 1.5:1.
13. The method of claim 12 wherein the coating composition is at a temperature of about 20-40 °C.
14. The method of claim 12 wherein step b is performed for about 25-75 seconds.
15. The method of claim 12 wherein the conversion coating composition comprises:
 - a. 0.020 to 0.075 mole/L chromium (III) ions,
 - b. 0.010 to 0.035 mole/L cobalt (II) ions, and
 - c. 0.010 to 0.045 mole/L nitrate ions.
16. A method for applying a colored conversion coating onto an article comprising the steps of:
 - a. plating the article with zinc,
 - b. exposing the article to a conversion coating composition comprising water, chromium(III) ions, cobalt(II) ions, fluoride ions, and nitrate ions, said conversion coating being substantially free of chromium (VI) ions and substantially free of an oxidizing agent,

- c. rinsing the article,
- d. exposing the article to a dye solution, and
- e. rinsing the article.

17. The method of claim 16 wherein the coating composition is at a temperature of about 20-40 °C.

18. The method of claim 16 wherein the step b is performed for about 25-75 seconds.

19. The method of claim 16 wherein step c is performed in water having a temperature between about 20-40 °C.

20. The method of claim 16 wherein the step d is performed for about 5-40 seconds.

21. The method of claim 16 wherein the dye solution is at a temperature of about 20-40°C.

22. The method of claim 16 wherein the dye solution has a pH between about 9-12.

23. The method of claim 16 wherein the dye solution includes a Mordant diazo dye and borate ions.

24. The method of claim 16 wherein the water of step e is at a temperature between about 20-60 °C.